Subject: The Subwoofer thing
Posted by Manualblock on Sat, 25 Feb 2006 13:47:53 GMT
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Interesting articles and discussion regarding sub-placement and arrangement downstairs here. But I must say what is the general consensus? Where do people put their subs to make good music? Obviously no one is going to buy four or five expensive subs; not to mention the home would look like a wharehouse with all those boxes. So how do we translate all these studies into a practicle application of principal? Because truthfully?, What I am getting from the discussion is basically, put 'em where they sound best!
Anyway is this discussion really applicable only to very expensive dedicated listening rooms of the rich audiophile?

Subject: Re: The Subwoofer thing
Posted by Leland Crooks on Sat, 25 Feb 2006 16:42:23 GMT
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Great thread. It's really enjoyable for us amateurs to listen to knowledgable people debate. Both points of view seem to make sense to me. "put 'em where they sound best!" That's half the fun of this stuff. Screwing around with trying wring that last vestige your system is capable of.

Subject: Woofers in general
Posted by Wayne Parham on Sat, 25 Feb 2006 17:07:34 GMT
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The same rules apply to woofers in all speakers. The range from about 200Hz down is the room modal region, so placement of full-range speakers determines bass and lower midrange in the room.

Subject: Re: Where'd the damn subwoofer come from, anyway?
Posted by Bill Epstein on Sat, 25 Feb 2006 17:49:55 GMT
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Seems to me it came along with Jantzen and KLH electro-stats. For the first time, there was a viable, even superior, departure from cone speakers.Unfortunately, they had little output in the bottom octave.So I have to ask? If you're designing home audio speakers, and not using planar or ribbon drivers, why wouldn't you include an F3 of 32Hz in every speaker you make?

Subject: Re:Read My Mind
Posted by Manualblock on Sat, 25 Feb 2006 19:04:57 GMT
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I never have understood the whole "Sub-wooofer" thing myself. Not to mention the fact that I have never heard one sound any good.

Subject: JBL 2242
Posted by spkrman57 on Sun, 26 Feb 2006 11:08:14 GMT
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manualblock,I guess you should hear a JBL 18" like the 2242 in a 9 cubic ft cabinet tuned to 28hz.I have no complaints about this sub, puts most 12" and 15" subs to shame!Ron

Subject: Re: JBL 2242
Posted by Manualblock on Sun, 26 Feb 2006 12:31:42 GMT
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What music is there down at that level Ron? I can't find any except maybe rap or Bach Organ recitals. They claim that the String Bass does 30HZ but I think that is true only for the lowest E on the lowest string. Seems like a lot of effort to hear a couple notes.

Subject: Henry Kloss
Posted by Bill Fitzmaurice on Sun, 26 Feb 2006 21:43:43 GMT
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He was the first to come up with the idea of separate satellites for the directional frequencies that could be placed where required for proper imaging and a separate enclosure for the non-directional frequencies that could be placed wherever it was convenient. Not everyone had room for a large Advent on their bookshelves.

Subject: Re: Henry Kloss
Posted by Manualblock on Sun, 26 Feb 2006 22:04:06 GMT
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The big Advent went pretty low in freq if I recall; and of course at the time cartridges and tape players rolled off pretty high up. I wonder where he was going with that.

Subject: Re: JBL 2242
Posted by spkrman57 on Mon, 27 Feb 2006 10:49:28 GMT
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I love to listen to pipe organ music with it. Truly a religious experience!Ron

---

Subject: Re: JBL 2242
Posted by Manualblock on Mon, 27 Feb 2006 12:32:06 GMT
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I put on mu old recording's of Train Sounds. And Sounds Of Nature Part2; "Thunderstorms."

Subject: Re: JBL 2242
Posted by hurdy_gurdyman on Mon, 27 Feb 2006 21:17:24 GMT
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The lowest note on the common four string bass is E at 41.3 Hz. Five string bass goes lower, probably around 30 Hz (the note is B, but I don't remember the frequency.) Many electric keyboards can get bass at or below 30 Hz. I suspect that few recordings use it, though, as most electronic music is intended for portable boom-box use anyway, where 30 Hz would sound very strange on those 6 inch speakers. There are some orchestra instuments that can go down to 30 Hz. I believe contra-bassoon goes to 28 Hz. Pianos go down into the 20's as well. Some big drums are tuned that low, also.

Action movies is where the subwoofer makes a big difference. Nothing like a 25 Hz rumble coming from an earthquake or dinosaur walking, or maybe a rocket taking off or bombs exploding. Very musical!

Subject: Re: JBL 2242
Posted by Bill Epstein on Tue, 28 Feb 2006 01:04:14 GMT
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There's more going on below 40 Hz then just fundamentals. There's hall ambience and decay. And a foundation (poor descriptor) to the music that's missed without.

Subject: Re: JBL 2242
Posted by Manualblock on Tue, 28 Feb 2006 01:09:44 GMT
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I understand why you say that but if the recording device used to make the recording; be it CD or Vinyl, does not have that information on it because it is rolled off; then do we still hear it?So the recordings that have information below the lowest fundamental; are there many of them? I know thats not the case for vinyl but maybe CD's have good information down there.Maybe you can answer this; does the lowest note on the string bass have harmonics below that frequency?How does that work?

Subject: Re: JBL 2242
Posted by Manualblock on Tue, 28 Feb 2006 01:15:20 GMT
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True Dave; some day I will watch a movie with dinosaurs walking in it and then I'll know. Does that only ring true for the Apatasaurus? Thats the big guy right?I was watching an interview with a famous director speaking about Akira Kurasowa; the guy who did The Seven Samurai and Rashomon. The director said he watches Akira's movies every couple months because he wants to remmember why he went into film to begin with because all he is allowed to make now is..."Special Effectas."

Subject: Re: JBL 2242
Posted by Bill Epstein on Tue, 28 Feb 2006 21:52:10 GMT
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I wish I knew more about recording and knew if all the notes were there. It really never occurred to me that there were lower limits to the sensitivity of the equipment.I also like to think I have at least a "Mr. Wizard" understanding of the science behind the .....things.... in our lives. Here, I'm clueless. But as I have aded more and cleaner 'bottom' to the presentation the reproduction of music has become, well, more musical.I know (by calculation)that my 2226 BR cabinet F3 is 36 Hz. 10dB down is, I imagine about 30 to 32 Hz. There should still be audible bass around -20dB. Those are just the numbers.Okay, we know that the low"A" on the piano is 27 Hz. So how come it comes through without having to strain to hear it? Could it be that our brains, as I read

somewhere, take the little bit of information that is -20dB and process it with thew rest of the music against a stored database of sounds and create for us a tone that is essentially flat in terms of sensitivity? Is that junk science?As I have added absorbers, diffusors and bass traps, more of that information has come out and my enjoyment has increased. Kinda empirical, aristotelian, evunnn. I try not to forget that Woody Allen was thrown out of his Metaphysics course for cheating on a test. He was caught looking into the soul of the guy next to him.

Subject: Re: JBL 2242
Posted by Manualblock on Wed, 01 Mar 2006 02:31:33 GMT
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Then he transfered over to the Black Studies Program because he wanted to learn how to be black. Maybe regarding the bottom notes; a better woofer and more sensitive loading of the driver gives a cleaner response consequently sounding like it is reproducing lower notes; then again...maybe not??

Subject: Re: JBL 2242
Posted by Thatch_Ear on Thu, 02 Mar 2006 11:56:43 GMT
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I have a stereo pair of isobaric subs that go down to about 20 Hz. They are biamped and the difference between when they are on or off is quite noticable.I am not sure how low my JBL D-123s go but no matter where they roll off at they are db down when they do. Say they roll off at 30 Hz (which I doubt) by the time they get that low they are producing the lows at a lower volume than the mids. If you are listening to a violin duet that is fine and dandy but if like me you occasionally get a wild hair and want to listen to some Yes at a bit higher volume the subs do make the difference between good and an emotional experience. Even for most of the music I listen with a strong leaning toward acoustil instruments the ability to be db up and to adjust that to taste definatly brings a different level to the listening experience.In case you are wondering about the isobaric there are 2 drivers facing the same direction, one sealed with the other ported but pushing the one in front. This gives you the low Fs of the ported sub, but adds speed so the driver in front can keep up with things like ribbons or electrostatic speakers. The drivers are not long excursion, which are best suited to HT or fart cars.

Subject: Re: JBL 2242
Posted by Manualblock on Thu, 02 Mar 2006 12:27:12 GMT
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Isobarick loading was the first pair of subs I ever used back around the early 80's. I understand the excitement of massive bass; it's visceral. But the Yes recordings were never known to have very wide frequency range. I would imagine that is not any where close to 30 hz that is being replayed. Have you checked the JBL specs for the 123; thats the 12 inch driver right? I think that rolls off pretty high up there. So now you are getting good bass using the sub-woofers.

Subject: What does the bottom end do?
Posted by spkrman57 on Thu, 02 Mar 2006 13:10:27 GMT
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Well, for one it makes your upper frequencies sound better also as there is treble info in the bass, and there is bass detail info in the upper freq's also.Also Thatch-ear, the bottom end of the D123 in standard reflex would be approx 45hz and drops like a rock after that.There is deeper bass available, but it is about 20db less the efficiency of the D123 as a whole.Ron

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Subject: Re: Henry Kloss
Posted by Bill Fitzmaurice on Thu, 02 Mar 2006 23:48:37 GMT
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The Advent went to 42 Hz, plenty low enough for music. But he might have been anticipating HT, he was the one who came out with projection TV after all.

Subject: Re: The Subwoofer thing
Posted by Earl Geddes on Mon, 20 Mar 2006 01:18:52 GMT
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I think that you may be missing the point. It is important to know what the best approach is so that we can move in that direction no matter how far to that extreme we go.As far as multiple subs go, I would never buy several expensive subs. But I would say, based on the work that I have done and my own experience, that I would much rather have several cheap subs than one expensive one. For a long time I used three $100 subs - worked very well. I did get an improvement by upgrading the subs quality, but it was not a tremendous improvement, noticable, but nothing earth shatering. The biggest improvement comes from the second sub with a little more from the third and diminishing returns from there. When multiple subs are used each sub need not be all that high performance. In fact I use smaller 12" divers to make the subs smaller, and lower power amps. Judicious choice of RANDOM locations can make them virtually invisible in almost any room, so I don't think that your appearance issue is really a concern. In my theater only one sub is visible all the rest are invisible. The surround speakers are far more obvious than the subs.And

you don't have to be a "rich audiophile" to get the very best sound. But you do have to be willing to make the sound a priority and do things right. In fact, it's not all that expensive to do things right, it's usually cheaper, it's just not what many people want to do. Sound really isn't the highest priority.For example spending large sums on electronics is a waste of money, but then when you do spend all that money the last thing that you want to do is hide it. I buy the lowest cost electronics and hide it - spend the money where it counts - on the speakers and the room.

Subject: Re: The Subwoofer thing
Posted by Wayne Parham on Tue, 21 Mar 2006 19:43:44 GMT
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Check out the post in the Studio Room forum called "Computer Simulation of Room Acoustics."

Subject: Re: The Subwoofer thing
Posted by Manualblock on Thu, 23 Mar 2006 15:19:19 GMT
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Sorry; I just realised this reply was here from Feb. I agree with your point regarding defining the best approach and movingm towards that application. You know it's very hard to reach a consensus regarding issues of sound and for what reason I have no idea. If the proper approach to integrating subs with existing equipment is so nebulous a concept that it basically comes down to trial and error; who decides what is the error? It certainly isn't sound quality because no one can even agree what constitutes acceptable sound quality.I have heard a dozen or so subs implemented but not one was bearable to listen too. How to explain that?

Subject: Not efficient
Posted by Earl Geddes on Tue, 28 Mar 2006 13:39:46 GMT
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"So I have to ask? If you're designing home audio speakers, and not using planar or ribbon drivers, why wouldn't you include an F3 of 32Hz in every speaker you make?" Its not practical to get every speaker in a two or three channel setup to go that last octave. I use a 15" for its high efficiency and directivity not for its LF capability, although that is a plus. But a cabinet to 25-30 Hz for a large high efficiency woofer is not practical.But it is practical to design a sub using a smaller woofer in a bandpass design that goes down to 25 Hz. It has a 25-50 Hz capability, matches up ideally to the closed box 50 Hz Summas, and has enough output over this very small bandwidth to keep up with the high efficiency woofers in the main channels. It probably does have a lower

MAX_SPL but it will still do 110 dB SPL in a small room at 35 Hz. Total volume of this approach is far below that of making each source go down to 25 Hz.

Subject: Speaker placement
Posted by Wayne Parham on Tue, 28 Mar 2006 15:03:21 GMT
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Speaking to the placement issue, how do you deal with the fact that bass and low mids in the modal region are coming from mains? I assume you suggest symmetrical placement for the mains, and probably you place them where they work best in the range above the modal region. Wouldn't this be less than ideal for bass and lower mids?I know it's a loaded question and that there are trade-offs to consider in every decision. But you must agree that since the mains carry so much bass, their placement and the perfomance that results is is an important aspect, maybe even more so than the subs. In your proposed configuration, the most troublesome room modes for most people will fall in frequency ranges covered by the mains, not the subs. Would you place midbass cabinets randomly around the room, same as you suggest for subs?

Subject: Re: Speaker placement
Posted by Earl Geddes on Tue, 28 Mar 2006 16:16:52 GMT
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Your loose usage of terminology makes answering your question difficult. Define Bass and low mids either in terms of frequency ranges or relative to the modal region.The mains must be placed at the best non-modal location relative to the room boundaries for the best direct field response, i.e. best image. This may or may not result in the best locations for the LF modal region frequencies. To this I add two smaller subs - one above the mid line of the room and another as far away from the mains as possible. These subs cover 35-120 Hz yielding about five speakers (center channel if used) at near random loactions covering the range from about 35 Hz and up. So where the mains are placed is basically irrelavent for the LF modal issues. I now add a single VLF sub to cover the 25-50 Hz region that the Summas can't reach. So only the frequencies from 25-35 Hz are not covered by several drivers, but at these frequencies the wavelengths are so long that it isn't possible to get multiple uncorrelated drivers anyways. This configuration yields the best LF response that I have ever obtained in a small room.So basically the room has 1 source 25-35 Hz, three sources 35-50 Hz, and four or five sources 50-120 Hz. Sure it would be great to have 5 sources 25-120 Hz, but thats not feasible. What I have is not only feasible and low cost but only one of these sources is even visible.

Subject: Re: Speaker placement

Posted by Wayne Parham on Tue, 28 Mar 2006 16:40:31 GMT
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I spoke of the modal region, which is basically the range below 200Hz. I also described this as bass and low midrange, which I think is reasonable.Best imaging comes from speakers that are placed symmetrically, as I'm sure you'd agree. But you've suggested running your mains down to 50Hz, so two octaves of the modal range are covered by them and only one octave by the subs. Since you prefer the modal range to be covered with speakers that are placed asymmetrically, how do you deal with that? After all, the worst modes in most average listening rooms are above 50Hz.

Subject: Re: Speaker placement
Posted by Earl Geddes on Tue, 28 Mar 2006 16:56:02 GMT
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Well I would define things differently.The modal region in my room is only up to about 100 Hz. 120 Hz max., most definately not 200 Hz. I would define Bass as anything in the modal region and "mid" as anything from the bass to about 500 - 1 kHz where our hearing perception starts to change. So to me, only bass is a modal concern. And, as usual, you don't appear to have read my response. Since I have five sources in the bass region above 50 Hz, its pretty much irrelavent where they are put. You are confusing what I claim. With enough subs, placement doesn't matter, symmetrical, asymmetrical, whatever, the differences are negligable. But for a finite number of four or less, placement is a factor and non-symmetrical is better. That doesn't mean that each and every source must be randommly placed only that a tendency for a random placement will tend to yield a better LF response. Categorizing everything I say into absolutes is not the way to an understanding of my position. Its not that black and white.So if two sources are forced into symetrical locations then put the others at random locations NOT more symmetrical ones. Its not that complicated is it?

Subject: Re: Speaker placement
Posted by Wayne Parham on Tue, 28 Mar 2006 19:21:22 GMT
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I understand now that you are really talking about three different kinds of woofers. One kind is used as woofers in the mains, which are to be symmetrically placed. Another is a VLF sub, used to augment the extreme bottom end, rolled off where the mains come online. And a third kind of woofer is placed randomly, covering a range of midbass, overlapping the mains and designed to smooth room modes.

Perhaps randomly placed midbass drivers will smooth the sound field in the midbass, up to 120Hz. It's a reasonable suggestion. Then again, your proposed configuration is relatively

complex with several woofers and crossover points. I also think having multiple distant and randomly placed sound sources run up through the upper bass to lower midrange might yield another set of problems. That's getting into the audio range where vocals, piano, guitar, cello, trombone and other wind and string instruments begin.

I suggest that we study various speaker placements in CARA to see the energy distribution through the room for each configuration.
Computer Simulation of Room Acoustics

Subject: Re: Speaker placement
Posted by Earl Geddes on Wed, 29 Mar 2006 13:20:26 GMT
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"Perhaps randomly placed midbass drivers will smooth the sound field in the midbass, up to 120Hz. It's a reasonable suggestion. Then again, your proposed configuration is relatively complex with several woofers and crossover points. I also think having multiple distant and randomly placed sound sources run up through the upper bass to lower midrange might yield another set of problems. That's getting into the audio range where vocals, piano, guitar, cello, trombone and other wind and string instruments begin."This is simply incorrect. So that we can get our terminology straight, to me, midbass lies above 100 Hz. Everything below 100 Hz. is simply bass and there are precious few musical instruments which have fundamentals in this region.In the modal (bass) region things like distances to the sources crossover frequencies and the like have little to no real meaning. And talking about 100 Hz (the upper limit of my multiple sub implimentation) as being "run up through the upper bass to lower midrange" is ridiculous. In the modal region the complexity of multiple subs is Exactly what one wants.

Subject: Re: Speaker placement
Posted by Wayne Parham on Wed, 29 Mar 2006 15:30:43 GMT
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You can make up your own definitions for bass, midbass, midrange, overtones and treble. Those are loosely defined regions, so it's probably more accurate to discuss specific frequency ranges. But 100Hz to 1000Hz is midrange to me, since that's where vocals and many other instruments lie. I identify the range from 1000Hz to 5000Hz also as midrange, but I like to call it the overtone region because that's what is usually present there, the harmonics generated by vocals and instruments. Treble is 5kHz and up, with 10kHz to 20kHz as the top octave. I consider everything under 100Hz to be bass, with content under 30Hz as deep bass and above 60Hz as midbass. Those are my definitions, so when you hear me use one of those phrases, you'll know what I'm talking about.

You can move the edges of your definition of "bass" and "midrange" up or down a half octave or

so, makes no difference to me. To me, the midbass to midrange, the area between about 60Hz to 180Hz or so, is a transition area that makes it harder to deal with. The modes are growing increasingly denser as we near the top of this range, but at the bottom the modes are still sparse and need smoothing. But this is also an area where localization becomes possible and you definitely want close integration with the mains. I tend to think the woofers used in this range should be spaced relatively close to the mains, just a few feet away, and probably should be symmetrical with respect to the mains. Deeper bass can be sent to subs placed further away, but midbass woofers should be nearer. Remote subs - especially distant ones - are better crossed down low.

Subject: Re: Speaker placement
Posted by Earl Geddes on Wed, 29 Mar 2006 15:55:19 GMT
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The summing is complex, thats exactly the point. The more complex it is the smoother it becomes. Simple summing (like subs close together) yields highly periodic and pronounced irregularities in the spatial and frequency response. You keep trying to apply HF concepts to the modal region and that simply does not work. And now you are contradicting yourself if you recommend the Welti approach because, if what you say were to be true then even the Welti's recommendations would not be acceptable.

Subject: Re: Speaker placement
Posted by Wayne Parham on Wed, 29 Mar 2006 17:10:30 GMT
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The whole philosophy of multi-subs is to introduce dense interference. My point is whether or not the deep bass range should be covered by randomly placed subs or symmetrically placed subs, I think the midbass sound sources probably should be symmetrical and closer to the mains. You can't run a distant sub up too high, but you do want multiple sound sources throught the entire modal range. That includes some frequencies that are really too high for distant subs, in my opinion. It's a competing set of priorities at the high end of the modal range.

Subject: Re: Speaker placement
Posted by Earl Geddes on Wed, 29 Mar 2006 19:25:42 GMT
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I noticed that you completely avoided my point about Welti - care to explain your way out of that?

Do you or do you not remember claiming that you recommend his approach? If so then what about his approach at 100Hz? And don't try and tell me that he was only interested in much lower frequencies because that is not at all the case.

Subject: Re: Speaker placement
Posted by Wayne Parham on Wed, 29 Mar 2006 20:16:02 GMT
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This has moved from a discussion about subwoofer placement into a more general discussion about subwoofer crossover frequencies and integration with mains.There are two issues here. One is the use of dense interference to smooth room modes. The other is of integration with mains, considering crossover points and slopes and distance between subs and mains.Dense interference can be accomplished at 100Hz using closer spacing than is required for dense interference at 35Hz because of the wavelengths involved. I'm saying I think probably it is worthwhile to have closer-spaced overlapping midwoofers for modal smoothing, and further spaced subs. The further subs might be arranged symmetrically as Welti suggests, or randomly as you suggest. But the nearby overlapping midwoofers should probably be symmetrical, to provide better imaging. They're the transition drivers, used up to the end of the modal range. They would work something like a traditional line array, but used only up to the Schroeder frequency.I think I understand your concept, its strengths and weaknesses. How about you? Do you understand what I am saying?

Subject: Re: Speaker placement
Posted by Earl Geddes on Wed, 29 Mar 2006 21:23:00 GMT
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I understand what you are trying to say, I just disagree with it."I'm saying I think probably it is worthwhile to have closer-spaced overlapping midwoofers for modal smoothing, and further spaced subs." i.e. non-Welti, or Geddes, a sort of Parham arrangement.Below 100 Hz "integration with the mains" is irrelavent - it is insignificant. Thus, to me, your "issues" are simply not relavent. And your argument for symmetric placement is weak because it will always yield a higher spatial and frequency variance than a random or partially random placement will and there are no "integration" issues.

Subject: Re: Speaker placement
Posted by Wayne Parham on Wed, 29 Mar 2006 22:36:41 GMT
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If we were discussing crossover below 100Hz, I might agree with you that integration with the mains was less troublesome, although I certainly wouldn't consider it to be irrelevant. But you have already indicated that you crossover above this point. That's where we disagree, as I see it. I would be more concerned with close spacing and symmetry as we get closer to the Schroeder frequency, where the sound field transitions from modal to reverberent.

Subject: Re: Speaker placement
Posted by Earl Geddes on Wed, 29 Mar 2006 23:22:12 GMT
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Wayne - things would go a lot better if you would just READ what I write.I never said that I "crossover" above 100 Hz, and I don't know where you got this idea. The only "crossover" would be at 50 Hz from the Summas to the VLF sub. The other subs don't crossover anything, they just augment the mains and simply fade away being down by about 6 dB at 100 Hz. with a very steep fall above about 120-150 Hz. So there is no potential for the things that you are ranting on about. This was all in my previuos posts, maybe not this concisely stated, but it was there. You seem to make up a lot of things that I never said.

Subject: Re: Speaker placement
Posted by Wayne Parham on Thu, 30 Mar 2006 15:06:36 GMT
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OK, so you don't have electrical crossover to rolloff your subs. You depend on the electro-mechanico-acoustic properties of the subs to roll them off instead. The distinction is irrelevant; The point is that there is output from multiple randomly-placed distant sound sources as high as 150Hz in your proposed configuration. That's pretty high frequency for subs - 130Hz is C below middle C - Definitely getting into the midrange at that point. I would not want that coming from multiple randomly-placed distant sound sources, not at all. I think it's worse than the room modes it tries to correct. Better to use a different configuration, in my opinion.

But I'm open minded. I plan to model your configuration as well as several others with CARA. I'll have to setup a system like that too; I'd like to hear what it sounds like.
Computer Simulation of Room Acoustics

Subject: Re: Speaker placement
Posted by Earl Geddes on Thu, 30 Mar 2006 15:53:55 GMT
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You still don't get it do you!!??I use bandpass subs with a 100 Hz ACOUSTIC low pass in addition

to the electrical LP that is in the amps. There is NOTHING of significance above about 100 Hz. Quit trying to top me on everything I say - I think that I know what I'm doing. If you don't agree with what I'm doing thats fine, but don't agree to what I actually say and what I am actually doing, not something stupid that you seem to imagine me doing.And my room is very well damped at these frequencies to boot. There are no distinctly measureable modes.You talk to me like I'm an amatuer who's guessing at what might sound good - and your going to set me straight. I've studied this problem in intensive detail for about 30 years - I hope that I've learned something along the way.

Subject: Re: Speaker placement
Posted by Wayne Parham on Thu, 30 Mar 2006 16:14:35 GMT
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I certainly don't see you as an amateur. But you did mention using your subs up to 120Hz in this thread, and I've seen you suggest using them up to 150Hz or so in other threads. To me, that's a problem if the subs are far away but not if they're fairly close. That's my point. You can blend woofers nicely up to 150Hz or higher, as long as they're close. It's like a short line array, which smoothes the midbass in the same way distributed subs do. But I think we'd both agree distant subs should be crossed lower than that.The only other way I could interpret your comments is that you suggest blending subs only up to 100Hz, in which case modes above that point cannot benefit from smoothing via dense interference. In that case, I say the same thing. A couple of sound sources spaced a few feet away from one another and overlapped in the midbass, up to the Schroeder frequency, will help smooth the modes without any localization problems. They're far enough apart to provide smoothing but close enough together to sound like one acoustic source.What I visualize is a sort of purposely "unfocused" sound field in the modal region that gradually transitions to a focused uniformly directional point source around the Schroeder frequency. I'm using the word "unfocused" in only an illustrative sense, because what I really mean is distributed sound sources at low frequency that gradually become less distributed as frequency rises, becoming a point source at or about the Schroeder frequency. I think what I'm describing does this perfectly, because it addresses modal behavior at very low frequencies as well as higher up, where there are competing priorities of modal smoothing and preventing localization of the subs. The way this is done is by using relatively closely-spaced overlapping woofers to blend just under the Schroeder frequency and subs placed further away using lower crossover points.

Subject: Re: d123's at the bottom end
Posted by tomt on Tue, 11 Apr 2006 02:25:54 GMT
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pair of d123" in a 12' cube box go to at least to 30 cycles

Subject: Re: Where'd the damn subwoofer come from, anyway?
Posted by tomt on Fri, 29 Sep 2006 22:41:31 GMT
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Really took off with the JBL 'artical-tisment' in the august '83 issue of Audio

Subject: Room modes, multisubs and flanking subs
Posted by Wayne Parham on Tue, 05 Apr 2011 20:24:04 GMT
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When I first considered the multisub approach, it was prompted by papers written by Todd Welti. He did several tests that showed in-room amplitude response could be made smoother using multiple subs, and gave specific guidance about placement. His favored locations for subwoofers in a rectangular room were to use a sub at each wall midpoint (four subs total), a sub at each room corner (four subs total) or a sub at opposite wall midpoints (two subs total). The idea is to counter self-interference from boundary reflections in the modal region using multiple sources to smooth the sound field. Where one sub and its reflection cancel each other out, another sub in a different location can fill it in.

I discussed this with Earl Geddes at the 2005 Great Plains Audiofest (later renamed the Lone Star Audiofest) and he proposed an alternate configuration, one that puts subs in a random or semi-random arrangement. His idea is that the statistical deviation throughout the room will be averaged better by decorrelation. It makes some sense mathematically, and common sense tell you that if you want to average everything, a random distribution might do that better than an ordered distribution. After all, the room dimensions and the reflections from them are periodic, so the best thing to do to break this up is to introduce a randomizing element. That's the Geddes idea, in a nutshell.

The problem with both approaches is they work best in the lower modal range, up to about 100Hz or so. This is because the average room size separates the woofer locations by wavelength scale at these frequencies. Spreading woofers around the room puts them tens of feet apart, and on a wavelength scale, this tends to smooth frequencies up to about 100Hz.

However, there remains about an octave of the modal range that isn't effectively mitigated by this approach. Room modes extend up to the Schroeder frequency, which is the approximate frequency where modes are no longer distinct and become more of an averaged field. The Schroeder frequency is a function of room dimensions, and is usually between 150Hz and 200Hz for most average home listening rooms. Similarly, there are also self-interference notches that can form in this range from the nearest boundaries, usually the floor, the ceiling and the wall behind the speakers. Each of these types of self-interference can (and usually do) create notches in the response between 100Hz and 200Hz, if not mitigated in some manner.

My proposed solution is to use blended local sources up to somewhere in the vicinity of 150Hz to 200Hz. This can be accomplished with dual woofers, blended mid/woofer or flanking subs. In any case, the blending of the two sources should not need to be run higher than the Schroeder frequency. A pair of woofers in the same cabinet, for example, may have a lower "helper" woofer

low-passed at 250Hz. Or a midrange/fullrange driver placed high on a baffle might be run down to 100Hz, blended with a woofer that is low-passed at 200Hz. Another possible solution, attractive with stand-mounted two-way speakers, is to run flanking subwoofers placed a couple feet away, run up to maybe 150Hz.

Geddes made the comment, a few posts back in this thread, that this is a "non-Welti, or Geddes, a sort of Parham arrangement". I suppose that's true, that flanking subs aren't specifically described by Welti or Geddes. However, some Welti configurations can be done this way. So while there are no Geddes configurations that implicitly include flanking subs, there are some Welti configurations that can.

Since Welti configurations are symmetrical, mains can be placed near the subs. For example, if subs are placed in or near each corner of the room, and stereo mains are placed near two of them, then the nearby subs are essentially flanking subs. With the right spacing and crossover (blending), the whole modal range can be made smooth, including mitigation of the nearest wall and floor bounce notches.

But this should not be taken to mean that flanking subs can only be used with Welti configurations. The mains can be setup with flanking subs, and then another one or two can be placed further away, located symmetrically as per Welti or in a random location as Geddes describes.

There is a tendency by some people to overcomplicate this approach, whether you choose the Welti, Geddes or Parham methods. It can be seen as a statistical approach to averaging the sound field. It can be seen as dense interference, like rain drop ripples in a pool. Both are accurate ways to view the situation. But it can also be seen as simply filling in holes.

Where one subwoofer and its boundary reflection combine to cancel each other, another sub fills it in. If you only had one woofer in the room, and you were sitting in a position where a large notch formed at a specific frequency, then it basically is "off" for you at this point. It is making no sound, or very little. Add another subwoofer, put it in a different location, and the self-interference from source to boundary won't cancel because it is in a different location. The phase between source and reflection is different, so the cancellation notch is at a different frequency. The sound for you is "on" at this frequency, from this second source.

At frequencies where both subwoofers are "on" for you, where they are phased properly to combine constructively, you will hear the sound at a little louder volume. At frequencies where one sub is "on" and the other is "off" from a self-interference notch, the sound will be slightly reduced because only one subwoofer is "on". But it is not nearly as much a reduction as if there were complete cancellation, like the single subwoofer setup would produce. So what you get with multiple subs is a little bit of ripple, but not a series of huge notches like a single sub produces.

The same is true at lower midrange (100-150Hz) frequencies, except the distances and scale are smaller. These are usually the result of a vertical mode, higher in frequency because the ceiling height is the smallest room dimension. A second woofer or flanking sub placed a couple feet away can be used to fill in the low-mid notch. At the frequency where the midrange or midwoofer is "off" because of self-interference from a vertical mode, the second speaker, placed a little lower to the ground, is "on" because it is at a different height.

Of course, at these lower midrange frequencies, localization cues are starting to emerge so you do not want the blended low-mid speakers too far apart. But by using a blended pair of sources placed relatively close together, you can greatly reduce the lower midrange notch without introducing an odd localization shift.

Subject: Re: Room modes, multisubs and flanking subs
Posted by Wayne Parham on Wed, 27 Apr 2011 19:18:31 GMT
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What sets the modal range apart from the reverberant range (also sometimes referred to as the statistical range) is the spacing between peaks and valleys. Up high, the interference is so dense it creates tightly spaced spikes. It looks like "grass" on a response chart and there really isn't any spectral imbalance - all frequencies are fairly equal. But down low, the peaks and valleys are widely spaced. A bass note progression through this range will become noticeably louder in the peaks and softer in the valleys. Vocals can sound throaty and congested, or thin and veiled, depending on where the modes fall in respect to vocalist's pitch. It is also very distinct on some musical instruments, especially piano.

To illustrate the kinds of response anomalies we're talking about in this thread, I've made a quick scan of the internet. It isn't hard to find examples. Notice the peaks and valleys below 200Hz.

Two different speakers, measured in the same room and at the same position:

Another pair of dissimilar speakers, in the same room, at the same position:

A mini-monitor on a stand, measured in-room:

A pair of McIntosh speakers, measured indoors:

Charts from RealTraps.com, talking about room modes and boundary interference:

A pair of Danley SH-50 speakers, measured indoors (in Tom Danley's house):

Subject: Re: Room modes, multisubs and flanking subs
Posted by Wayne Parham on Wed, 12 Dec 2012 21:18:41 GMT
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Specific multisub placement advice:
Welti configuration
Geddes configuration
Parham "flanking sub" configuration
